Developing a Coastal Health Index for the Northern Gulf of Mexico

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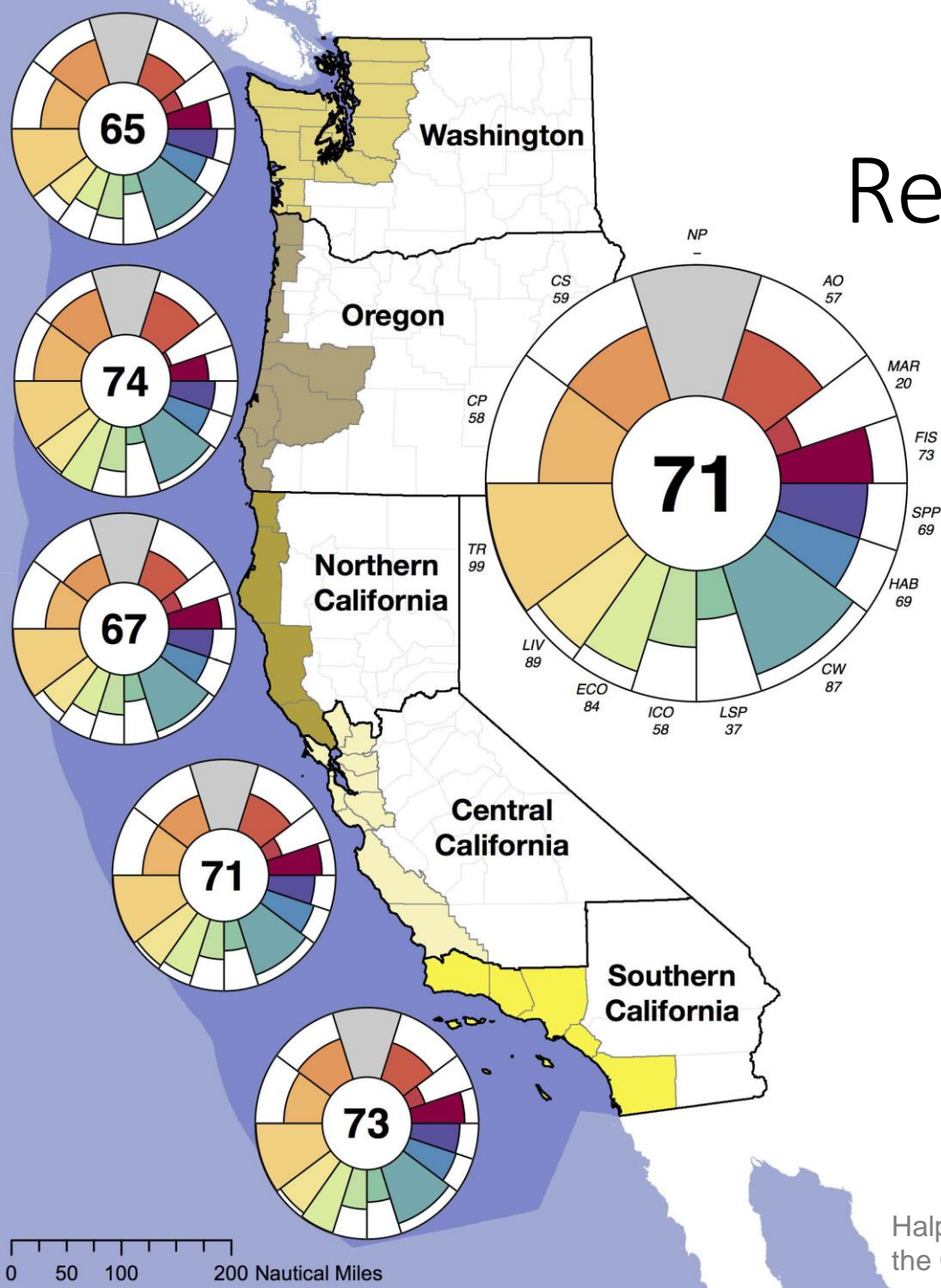
NMC: March 27, 2019

Background

- <u>Ecosystem Based Management:</u> site specific approach to natural resource management that aims to protect the health, function and resilience of an entire ecosystem for the benefit of all organisms.

- Integrate Metrics:
  - Biological
  - Chemical
  - Remotely Sensed
  - Economic
  - Societal

Adapt

Design

Act

Monitor

Evaluate
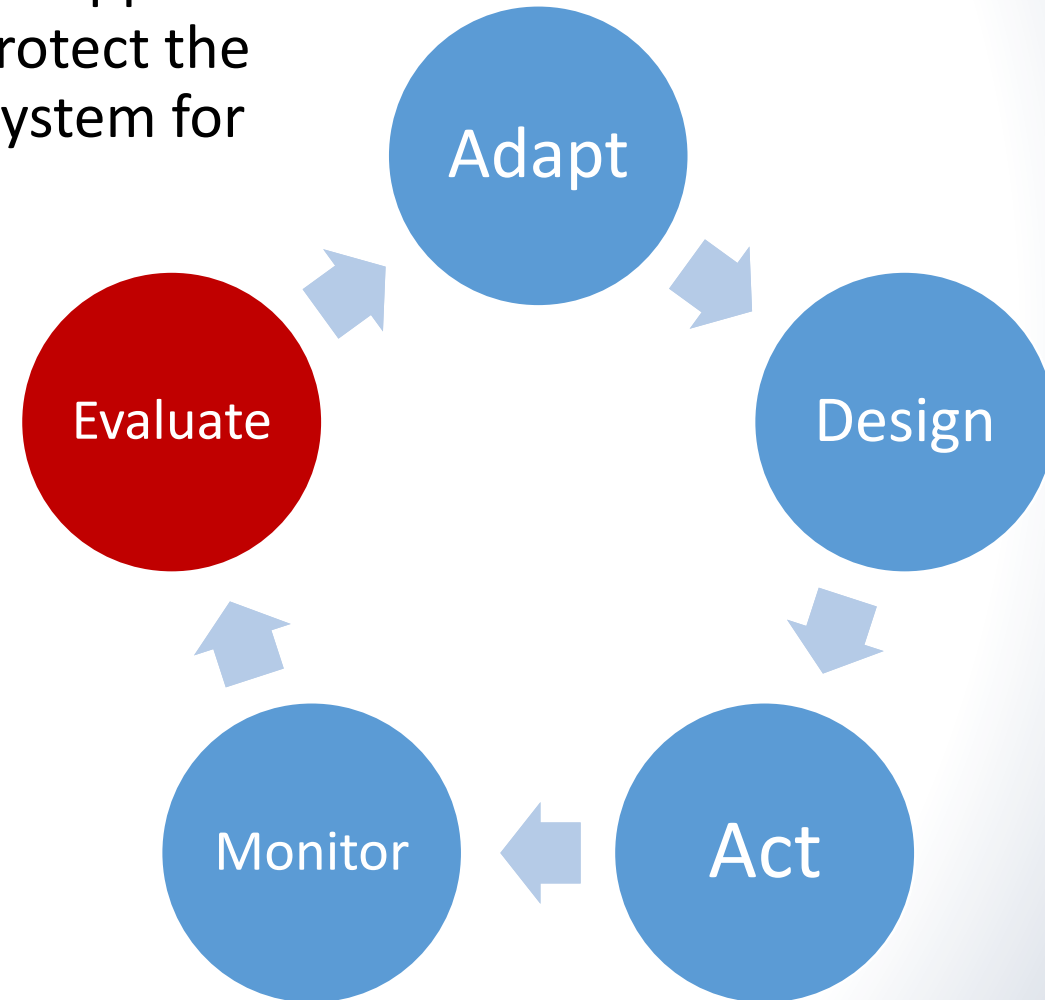
Regional Ocean Health Indices

- Ecosystem-based management

  - Raise public awareness

  - Identify knowledge gaps

  - Prioritize management & research

Halpern BS,, et al. (2014) Assessing the Health of the U.S. West Coast with a Regional-Scale Application of the Ocean Health Index. PLoS ONE 9(6): e98995. doi:10.1371/journal.pone.0098995

Coastal Health Index

Variables	Sub-Variables	Definition
Food Provision (FP)	Fisheries (FIS)	Harvest of sustainabily caught seafood
	Aquaculture (AQA)	Production of sustainably-cultured aquatic food
Artisanal Fishing (AO)		Opportunity to engage in artisanal-scale fishing for subsistence
Natural Products (NP)		Sustainable harvest of renewable natural products other than food provision
Carbon Storage (CS)		Potential of natural habitats to afford long-lasting carbon storage
Coastal Protection (CP)		Status of natural habitats affording protection of the coast
Tourism and Recreation (TR)		Economic stability of recreation and tourism supported by a healthy coast
Coastal Livelihoods and Economies (LE)	Coastal livelihoods (LIV)	Jobs and wages from marine-related sectors
	Coastal economies (ECO)	Revenues and Establishments from marine-related sectors
Sense of Place (SP)	Lasting Special Places (LSP)	Cultural or aesthetic connection to the environment afforded by protected places
	Iconic Species (ICO)	Cultural or aesthetic connection to the environment afforded by iconic species
Clean Waters (CW)		Clean waters that meet basic aquatic life use standards
Biodiversity (BD)	Biodiversity of Habitats (HAB)	The existence of biodiversity afforded by the conservation status of habitats
	Biodiversity of Species (SPP)	The existence of biodiversity afforded by the conservation status of coastal species

$$CHI = a_1 V_1 + a_2 V_2 + \cdots + a_{10} V_{10}$$

Study Area

Defining ecologically, geographically, and politically coherent boundaries for the Northern Gulf of Mexico coastal region: Facilitating ecosystem-based management

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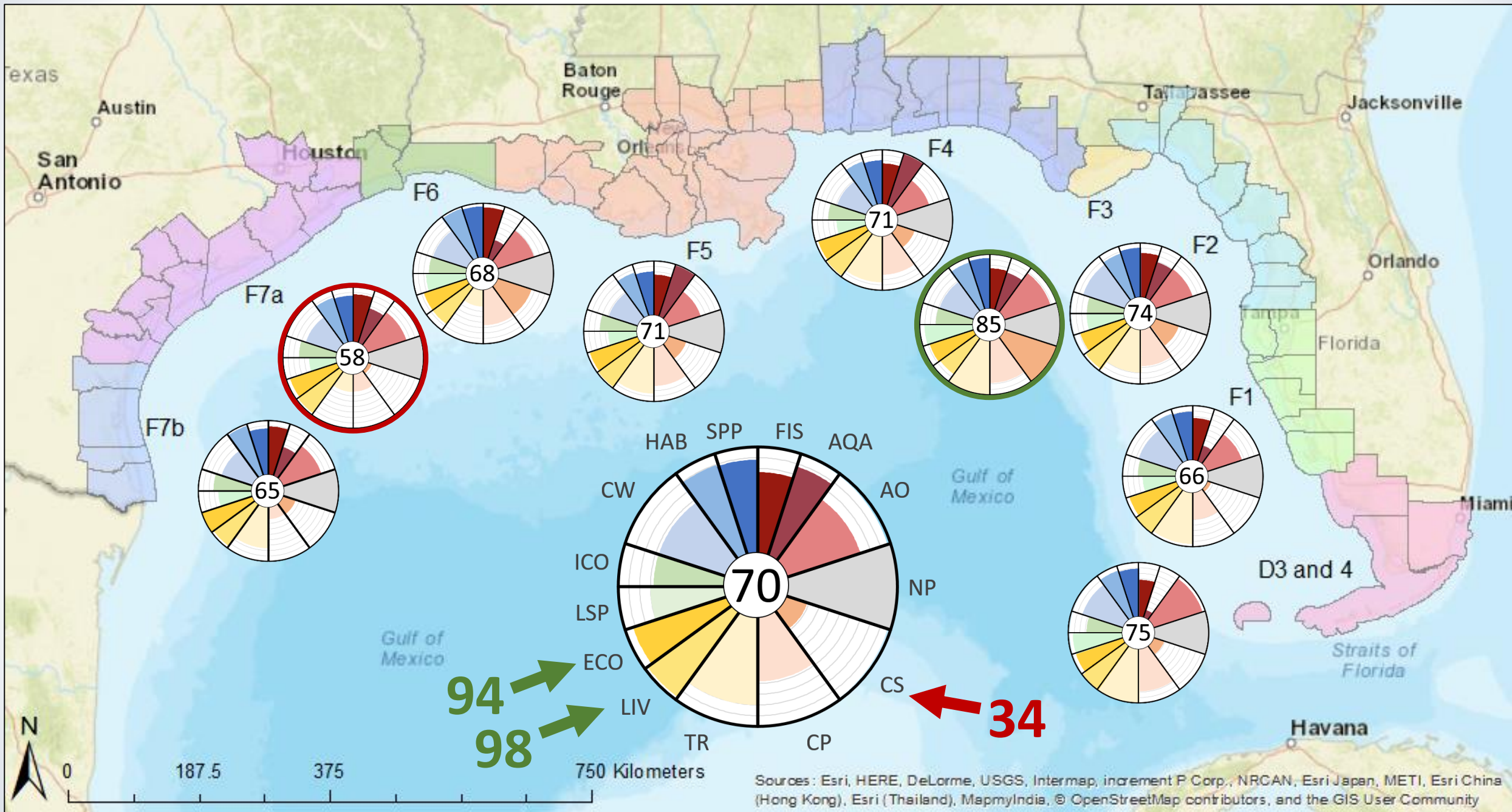
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CHI Results

Variable	Sub-Variable	GOM	F7b	F7a	F6	F5	F4	F3	F2	F1	D3and4
Food Provision (FP)	Fisheries (FIS)	76.5	88.7	86.6	92.4	74.7	84.1	74.1	81.1	77.2	67.9
	Aquaculture (AQA)	87.5	55.2	65.7	35.3	98.1	24.3	71.4	68.8	29.3	13.6
Artisanal Fishing (AO)		70.6	72.9	73.5	68.9	60.9	80.7	87.8	70.2	65.7	93.1
Natural Products (NP)		--	--	--	--	--	--	--	--	--	--
Carbon Storage (CS)		18.0	23.1	6.2	64.0	32.9	26.9	100.0	43.8	5.6	18.8
Coastal Protection (CP)		58.1	22.1	32.3	65.8	71.2	49.7	78.1	67.3	49.9	78.5
Tourism and Recreation (TR)		80.2	75.8	33.1	31.1	85.4	95.2	100.0	79.3	94.9	100.0
Coastal Livelihoods and Economies (LE)	Coastal livelihoods (LIV)	96.9	95.4	96.3	85.8	97.5	99.3	83.6	96.8	99.3	99.6
	Coastal economies (ECO)	92.3	99.9	92.8	85.6	95.1	97.3	87.1	88.5	93.4	93.7
Sense of Place (SP)	Lasting Special Places (LSP)	70.1	62.8	51.6	75.6	54.8	56.2	91.0	70.9	62.7	93.2
	Iconic Species (ICO)	67.1	71.8	70.4	70.5	70.0	70.0	70.0	70.0	71.7	67.7
Clean Waters (CW)		67.1	61.4	62.1	68.0	58.0	82.8	67.9	82.7	75.1	80.6
Biodiversity (BD)	Biodiversity of Habitats (HAB)	89.5	96.4	86.5	96.7	84.3	84.8	91.2	86.7	91.7	91.5
	Biodiversity of Species (SPP)	88.2	85.1	84.3	94.3	80.6	83.7	93.2	90.9	89.2	88.7
Coastal Health Index (CHI)		**69.8**	**64.8**	**58.2**	**68.4**	**70.7**	**70.6**	**85.0**	**74.5**	**66.5**	**75.4**

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Region

Stakeholder Survey

- Social Media
- Targeted E-mail
- Survey
  - Value importance when determining if a coastal ecosystem is healthy
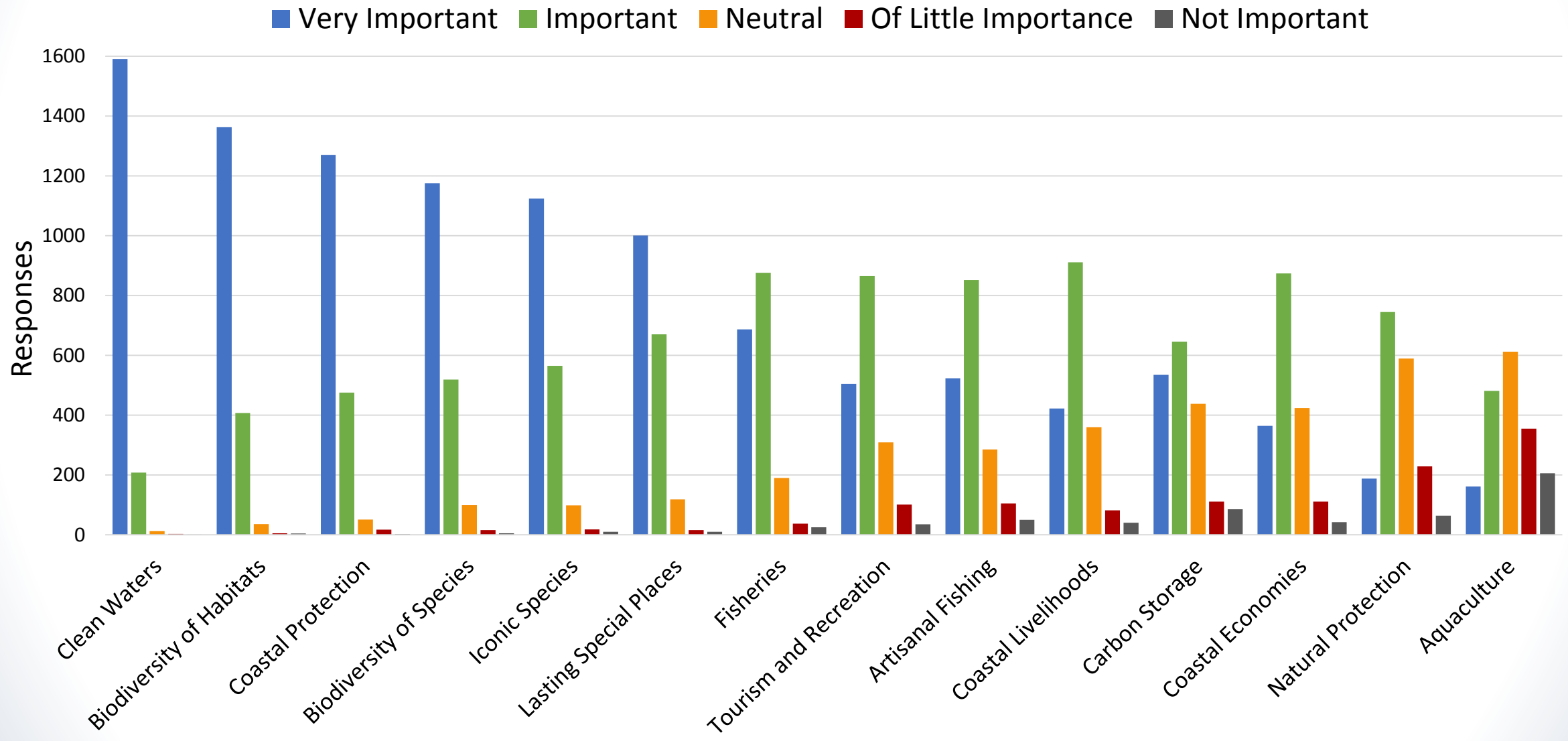   - Likert Scale
  - Differentially weight model

Do you live, work, or vacation along the Texas Gulf Coast? Please take a short survey on the health of your coast.
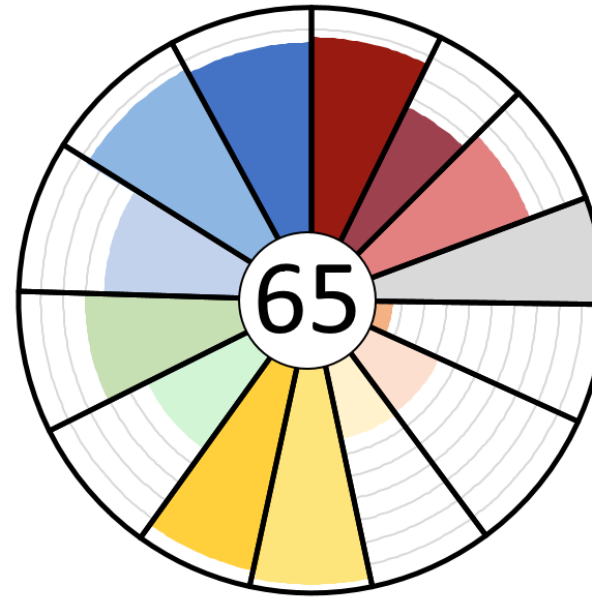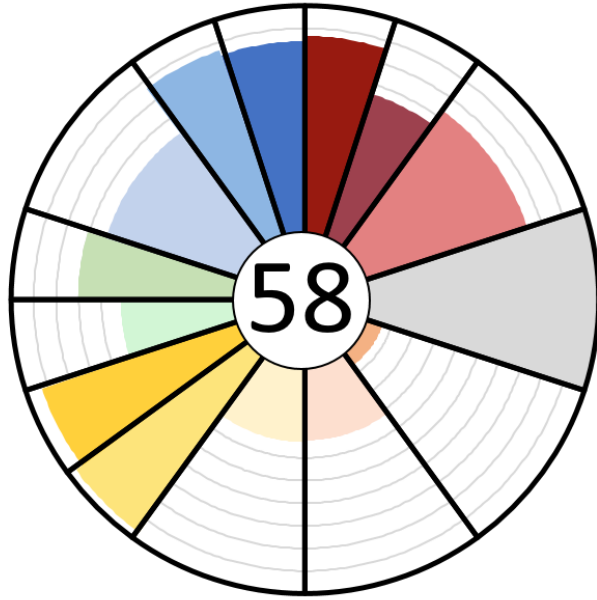https://www.surveymonkey.com/r/TexasGulfCoast

Original Model

Differentially Weighted

F7a

58

65

F7b

65

70
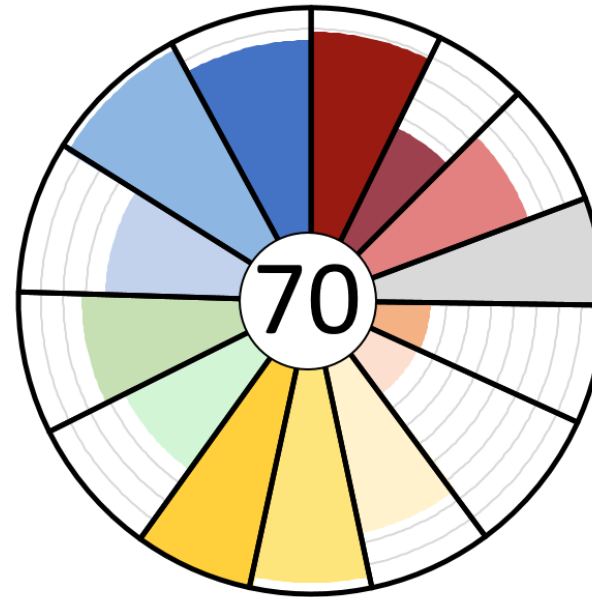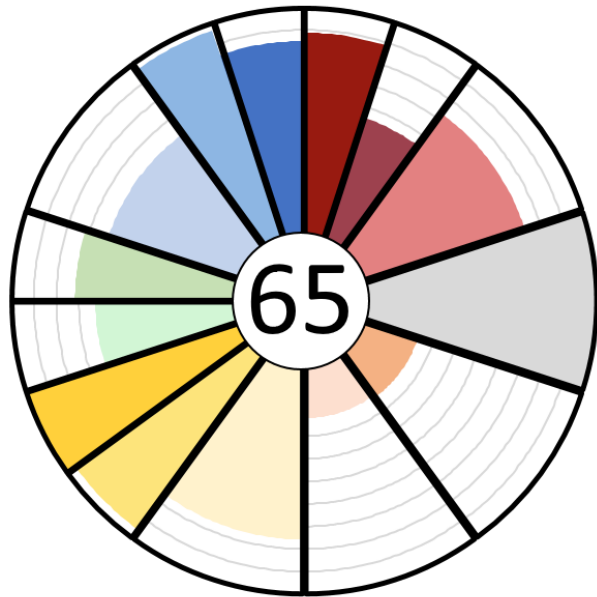
Sub-Variables

Fisheries
Aquaculture
Artisanal Fishing
Natural Products
Carbon Storage
Coastal Protection
Tourism and Recreation
Coastal livelihoods
Coastal economies
Lasting Special Places
Iconic Species
Clean Waters
Biodiversity of Habitats
Biodiversity of Species

Summary of Findings & Other Results

- Heterogeneous health measured by CHI across the Northern GOM.
- Some regions are more stressed than others
  - Research/management focus areas
- Some declining trends in scores through time
- Stakeholders value variables differentially
  - CHI weighted using stakeholder values = higher score
  - Stakeholders demographics significantly influence their perception of variable importance.

Acknowledgements

- Data Sources and Data Managers
  - NOAA (C-CAP, ENOW)
  - EPA (NCCA)
  - State Resource Agencies (TPWD, LDWF, MDWFP, ADCNR, FWC)
  - USDA (NASS)
  - USGS (PAD)
  - Nature Serve
  - Jones and Kammen (2014)
  - US Department of Labor (BLS)
  - IUCN
- Financial Support
  - Texas A&M University, Marine Biology Interdisciplinary Program
  - Texas A&M University, Wildlife and Fishery Science
  - University of Houston-Clear Lake, and EIH
  - Texas Chapter of the American Fisheries Society

Thank You

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